Original article

Psychopathological consequences after a terrorist attack: An epidemiological study among victims, the general population, and police officers[☆]

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Abstract

Background and aim. — To assess the prevalence and correlates of post-traumatic stress disorder (PTSD), major depression and anxiety disorders other than PTSD, among three samples with different level of exposure to the March 11, 2004 terrorist attacks in Madrid.

Method. — We sampled three groups of persons—those injured in the attacks, the residents of Alcala de Henares, and police officers involved with the rescue effort—with different exposure to the March 11, 2004 terrorist attacks, using random sampling from comprehensive censuses of all three groups. In person interviews were conducted with all three groups between 5 and 12 weeks after March 11, 2004. Questionnaire included assessment of socio-demographic characteristics, of PTSD using the Davidson trauma scale, and of a range of psychiatric illnesses using the mini international neuropsychiatric interview (MINI).

Results. — The overall sample included 127 persons injured in the attack, 485 residents of Alcalá de Henares, and 153 policemen involved in rescue. Of all three groups 57.5%, 25.9% and 3.9% of persons, respectively, reported symptoms consistent with any assessed psychiatric disorder. The use of psychoactive medication before March 11, 2004 was consistently the main predictor of PTSD and major depression among those injured and of major depression and anxiety disorders others than PTSD among residents of Alcala.

Conclusions. — There was a substantial burden of psychological consequences of the March 11, 2004 terrorist attacks two months after the event. Persons with prior mental illness are at higher risk of post-event psychopathology, across groups of exposure.
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Keywords: Mental disorders; Disaster; Terrorism; Victims; Population; Rescuers

1. Introduction

On March 11, 2004, at 7:40 a.m. Madrid suffered the most devastating terrorist attack in its history. In total 10 bombs exploded in 4 different commuter trains headed toward Atocha Station in downtown Madrid. More than 1400 persons were

taken to the emergency rooms of different hospitals, and 192 (9.5%) people died in the attacks [25]. This extent of destruction after a terrorist attack was unprecedented in the European Union [8,22]. The long-term economic, and psychosocial effects of this tragedy were unknown [24].

Post-traumatic stress disorder (PTSD) is one of the most frequent and debilitating psychological disorders documented in the aftermath of disasters [10,27]. A number of studies have shown a high burden of PTSD in specific groups such as adults in the general population [11], direct victims of terrorist attacks [26], or rescue workers [28] after disasters. The literature about other psychological consequences of disasters is much more sparse, although it has been shown that depression, anxiety disorders other than PTSD, and panic disorders are more prevalent after disasters than in non-disaster situations [26].

One of the challenges in generalizing from the disaster literature is that very few studies have simultaneously considered the psychological consequences of disasters among several groups simultaneously using comparable instruments and research methods. Hence to some extent, cross-group comparisons and extension of what is currently known to future disasters remains limited [11].

The aim of the study was to document the prevalence and correlates of PTSD and other psychological disorders in three population groups after the March 11, 2004 terrorist attacks. We compared persons injured during the attacks, residents of Alcala, and policemen who helped in the March 11 terrorist attacks in Madrid.

2. Methods

2.1. Study design

The sampling frame was a comprehensive set of all three groups of interest who were influenced by the March 11, 2004 terrorist attacks, namely:

a. Approximately 1400 persons injured in the attacks,
b. One hundred and twenty-one thousand adults residents of Alcala [16],
c. Three hundred and thirty-five police officers who helped in the rescue effort.

We assessed a sample of all three groups between 5 and 12 weeks after March 11, 2004. Target sample sizes for each group were estimated based on best-available estimates of prevalence of PTSD could be expected in each group [12,6,17].

2.2. Study populations

2.2.1. Persons injured in the attacks

The target population as any person who was injured in the March 11 attacks and seen at the emergency rooms of 4 large hospitals: Gregorio Marañón (HGM), 12 de Octubre (H12O), La Princesa (HP) and Príncipe de Asturias (HPA) between 8:00 a.m. and the midnight of March 11, 2004. Approximately

1400 people were injured in the terrorist attacks; 754 (54%) of these were seen in one of these 4 hospitals: 41%, 35%, 13%, and 9.5%, respectively [32,31]. We drew a proportional random sample of 132 subjects from the 754 injured persons seen at these 4 hospitals. The response rate for this assessment was 96% (127 of 132 invited). Interviews were performed by psychiatrists and 10% were supervised by an independent expert.

2.2.2. Residents of Alcala

We calculated a minimum sample of 540 individuals to achieve an absolute precision of 2% for the PTSD prevalence estimation. This sample accounted for an expected rejection rate of 30%. The city's statistics office generated an age–sex-stratified random list of 1110 individuals 18–64 years of age. We contacted 633 persons (58%) of the 1110 previously selected, and 485 of those contacted participated. The response rate was 77% (Fig. 1).

Letters signed by the Mayor of Alcalá and the President of the University were used to invite participation and to explain the study procedures to those selected for study participation. Trained interviewers went door-to-door and administered the questionnaires to participants. The interview training was supervised by an epidemiologist (RG) and a psychiatrist (LF). The interviewers received two training sessions (one for explanation of study design and instruments to be used, and other to perform supervised test interviews with voluntaries). Training lasted 8 h in total. At the close of training, each interviewer was required to conduct a direct screening interview with a subject. This interview was observed and critiqued by the supervisor. If the interviewer showed a mastery of the survey methods to be employed, he or she was deemed ready to begin data collection. A written manual was provided to each trainee, to serve as a reference guide during the field operations.

In order to increase internal validity of the information collected, each interview was performed by two interviewers. Both interviewers collected the information, and a consensus was reached if there were any discrepant answers. In addition,
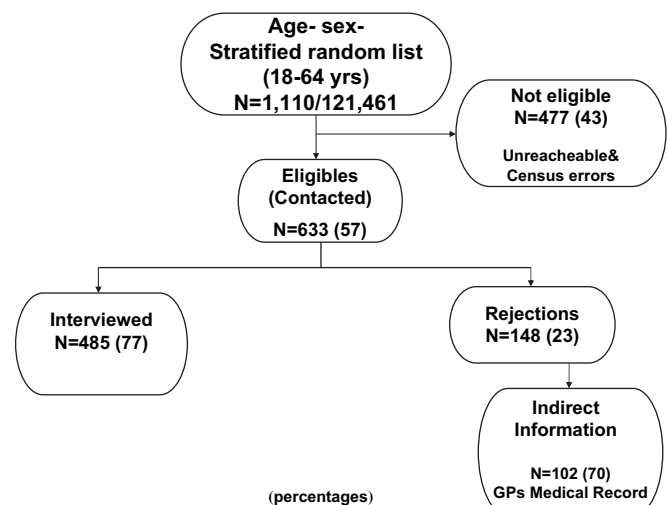

Fig. 1. Alcalá study population flow chart.

we estimated the concordance between the interviewers and the expert psychiatrist (LF), on a random subsample of 10% interviews performed in Alcalá. The overall agreement rates were over 90% for all mood and anxiety disorders.

For those persons who refused to participate or gave incomplete answers to key survey questions, we used available medical documentation (e.g. hospital discharge reports or primary care medical records), to assess likely prevalence of suspected diagnoses.

2.2.3. Police officers

We attempted to interview the full census of police officers involved in the rescue efforts. We successfully interviewed 153 police officers who represented the 46% of target population (N = 335) involved in rescue efforts. One hundred and twenty-three were from the Special Intervention Corp (a specially trained group who respond to terrorist events); 21 from the explosive searching team (TEDAX), and 21 from the victims identification team (Scientific Police). Police officers were interviewed at the headquarters by the same interviewers who carried out the interviews in Alcalá. The interviews were anonymous. Ten percent of the interviews were supervised by the same expert.

2.3. Interview tools

The same questionnaires were used for the three study groups. Questionnaire domains included the following.

2.3.1. Socio-demographics and exposure

We assessed age, gender, educational level, profession, social supports (origin, religión, life styles), general health status (main chronic diseases and consumption of drugs). Lifetime traumatic experiences, life stressors during the last year (loss of relatives, loss of work, accidents, etc.), and exposure to the 11M traumatic event (i.e. use of train on March 11, 2004, frequency of train use and relatives or friends victims of the attacks). For those injured in the attacks we specifically recorded the type and the severity of lesions noted in the emergency room. We assessed whether psychological help was received after the attacks.

For policemen we also recorded the main task performed (rescue efforts, custody of dead, searching and deactivation of explosives and body identifications) and total time involved in these tasks.

2.3.2. PTSD

We used the Spanish version of the Davidson Trauma Scale (DTS) to assess PTSD [9,2]. The DTS is a self-administered scale composed of 17 items corresponding to each of the 17 DSM-IV symptoms. Items can be categorized as follows: items 1—4, 17: criteria B (intrusive re-experiencing); items 5—11: criteria C (avoidance and numbness); and items 12—16: criteria D (hyperarousal). The intrusive and avoidant items are asked with reference to the event, while the numbing, withdrawal and hyperarousal items are rated as present or absent without direct linking to the event. For each item, the subject rates both frequency and severity during the previous week on a 5-point (0—4) scale for a total possible score of 136 points. Subscale scores can be computed separately for frequency and severity. Diagnostic assessment using the DTS relative to the SCID, yield respectable accuracy. At a score of 40, the positive predictive value, negative predictive value, and efficiency are 0.92, 0.79 and 0.83, respectively. Any subject scoring ≥ 40 points in the DTS was considered as having probable current PTSD. This instrument's Spanish version has been previously validated.

2.3.3. Other mental disorders

We used the mini international neuropsychiatric interview (MINI), Spanish version [23,35,3] for the assessment of other mental disorders. The MINI provides current diagnoses according to the international classification of diseases (ICD-10) and the diagnostic and statistical manual for mental disorders (DSM-IV). We assessed major depression, panic disorder, social phobia, generalized anxiety disorder-GAD, and, agoraphobia. Prevalence estimates of mental disorders were determined by whether respondents' current symptoms met the diagnostic criteria for a DSM-IV disorder. For current Major depression the symptoms had to have been present during the two weeks prior to the interview. For anxiety disorders (Agoraphobia, GAD, Social Phobia and Panic Disorders) the symptoms had to have been present for a minimum of one month prior to the interview. For the detection of major depression, the MINI interview shows a sensitivity of 96%, a specificity of 88%, and an overall efficiency of 92%. The corresponding figures for agoraphobia are 85%, 88%, and 87%. For GAD sensitivity is 91%, specificity 86% and the overall efficiency 87% [6,17].

2.4. Ethics

The study was approved by the institutional review boards of the Hospital General Universitario Gregorio Marañón (HGUGM). A signed statement of informed consent was required of every survey participant. We obtained permission from the Madrid region health authority, and the local Institutional review board to obtain additional medical information about the selected subjects through the national care system database. At the same time, we informed all participations about the potential of using his/her medical information for the only purposes of the study, and about the option of opting out of this process. No participants refused.

The medical information gathered during the study was strictly confidential, and only available to authorized personnel.

2.5. Statistical analysis

Period prevalence and 95% confidence intervals were used to measure disease frequency, and the prevalence date used was May 1, 2004. For inclusion in the prevalence numerator, the subject had to be alive on May 1, 2004 (prevalence day), and the onset of the disorder must have occurred on or before

that date. We calculated both the overall (any) and specific prevalence of current mental disorders, and the prevalences according to covariates of interest. Two-tailed chi-square tests, bivariate odds ratios (ORs) and 95% confidence intervals (CI) were used to identify associations between covariates and either depressive or anxiety disorders. Separate stepwise (forward method) multiple logistic regressions were used to investigate covariates associated with the likelihood of depression and any anxiety disorder; multiple regressions were conducted in the injured and Alcala groups. Covariates were considered in the multivariate regression models where bivariate chi-square P-values were less than 0.1. Differences in log likelihood ($P < 0.05$) were used to determine whether variables would be retained in subsequent models. We tested for interactions between key predictor variables in the final models. All the calculations were performed with the SPSS version 10 program.

3. Results

3.1. Demographics (Table 1)

The mean ($\pm$SD) age of the persons injured who participated in this study was 36.9 ($\pm$10.7) years, 54% were men and 41% were immigrants. The mean ($\pm$SD) age of the participant residents of Alcalá was 39.1 ($\pm$12) years and proportions of persons in each age, sex, race or ethnic group were similar to estimates obtained from the 2003 Spanish Census for our sampling frame (data not shown). The mean age of police officers in this study was 36.4 ($\pm$8.3) and 93% were men. Thirty-four percent of those injured, 0.4% of the residents of Alcalá and 2.6% of the police officers in this study reported use of psychological services after the attacks.

3.2. Prevalence of current mental disorders (Table 2)

The prevalence of current mental disorders was 57.5% among injured (95%CI, 48.4–66.2); 25.9% (95%CI, 22.1–30.1), among the population of Alcala and 3.9% (95%CI, 1.5–10.9) among police officers.

3.3. Prevalence of current PTSD and symptoms of PTSD (Tables 2 and 3)

The prevalence of PTSD was 44.1% (95%CI, 35.3–53.2%), among those injured, 12.3% (95%CI, 9.6–15.6%) among the residents of Alcala and only 1.3% (95%CI, 0.2–4.6%) among police officers. Intrusive ideas were the most frequent symptom in the three groups: 96.1%, 87.2%, and 60.1%, respectively. All three categories of symptoms in the DTS scale (intrusive ideas, avoidance behavior, and hyperarousal – criteria B, C, D – respectively), were significantly higher among those injured than in the general population of Alcala and lowest among police officers.

Table 1
Socio-demographic characteristics of the three samples

	Alcala (%)	Injured (%)	Police (%)
Overall participation	67	96	100
Age (mean $\pm$ SD)	39.1 $\pm$ 12	36.9 $\pm$ 10.7	36.4 $\pm$ 8.3
Gender (%men)	49	54	93
Country of origin (%Spain)	99	59	98
Education level			
Primary school	37.5	21.3	57.5
Secondary or higher	62.5	78.7	42.5
Profession			
Workers	77.3	72.4	
Professionals	15.9	19.5	
Businessmen	4.8	1.6	
Students	1.4	4.9	
Housewives	0.7	1.6	
Social support			
Low	10.3	35.5	9.2
Medium	87.0	64.5	74.5
High	2.7	0	16.3
Relatives or friends victims	14.2	18.9	5.2
Use of trains the 11M	4.1	100	
Frequency use of trains			
2–3 per week/daily	15.0	82.7	
Occasionally/never	85.0	17.3	
Life stressors (last year)	34.6	52.8	24.2
One	27.6	39.4	21.6
Two or more	7.0	13.3	2.6
Psychiatric history	20.8	26.8	2.0
Self-reported	7.6	1.8	0.7
By MINI	16.5	26.8	2.0
Current use of psycho-drugs	8.0	5.5	0.7
Psychological help since 11M	0.4	34.0	2.6

3.4. Prevalence of current major depression (Table 2)

The prevalence of major depression was 31.5% (95%CI, 23.5–40.3) among the injured, 8.5% (95%CI, 6.1–11.3) in the population of Alcalá, and 1.3% (95%CI, 0.2–4.6) among police officers.

3.5. Prevalence of current anxiety disorders others than PTSD (Table 2)

The prevalence of agoraphobia was 23.8% among injured and 10.5% in the population of Alcalá. The prevalence of GAD was 13.4% among those injured and 8.6% in the population of Alcalá. The prevalence of panic disorder was 9.4% among those injured and 2.1% in the population of Alcalá.

Apart from two police officers who reported symptoms consistent with depression, no other psychopathology was observed among the police officers (one of these two individuals also met criteria for the other mental disorders considered).

Table 2
Current prevalence of mental disorders in the three samples

	Injured % (95%CI)	Alcala % (95%CI)	Police % (95%CI)
Any mental disorder	57.5 (48.4–66.2)*	25.9 (22.1–30.1)	3.9 (1.5–10.9)
PTSD	44.1 (35.3–53.2)*	12.3 (9.6–15.6)	1.3 (0.2–4.6)
Major depression	31.5 (23.5–40.3)*	8.5 (6.1–11.3)	1.3 (0.2–4.6)
Agoraphobia	23.8 (16.5–32.0)*	10.5 (7.9–13.6)	0.7 (0.2–3.6)
GAD	13.4 (8.0–20.6)*	8.6 (6.3–11.5)	0.7 (0.2–3.6)
Panic disorder	9.4 (5.0–15.9)*	2.1 (1.0–3.8)	0.7 (0.2–3.6)

Current prevalence denotes the presence of symptoms consistent with the diagnosis of a particular mental disorder: within 15 days prior to the interview for major depression, and 30 days for anxiety disorders.
PTSD: post-traumatic stress disorder; GAD: generalized anxiety disorder.
*Significant differences ($p < 0.05$) between injured and Alcalá samples.

3.6. Frequency of current comorbid mental disorders (Table 4)

The proportion of participants who shared comorbid mental disorders (2 ó more anxiety o depressive disorders) was 52.8% among those injured, 22% among the residents of Alcalá and 2% among police officers.

The most frequent comorbid mental disorders were PTSD and depression. Victims (25.2%) and residents (4.5%) of Alcalá reported symptoms consistent with comorbidity between PTSD and depression. The second most frequent comorbid mental disorder among injured was PTSD and agoraphobia with 16.5% of the victims reporting this comorbidity. The second most frequent comorbid mental disorder set among residents of Alcalá was major depression and GAD; 3.5% of residents of Alcala reported this comorbidity.

3.7. Factors related with mental disorders: multivariate analyses (Table 5)

Significant predictors of PTSD were as follows:
Among the injured, the use of psychoactive medications before March 11 (odds ratio, 7.9).

In the general population of Alcala: history of psychiatric disorder (odds ratio, 6.4), female gender (odds ratio, 2.4), eny stressors in the 12 months before March 11 as compared with none (odds ratio, 2.3) and use of train on March 11 (odds ratio, 5.6).

Significant predictors of major depression were as follows:
Among the injured, the use of psychoactive drugs before March 11 (odds ratio, 7.4) female gender (odds ratio, 2.2),

and more than one life stressors during last year (odds ratio, 3.3).

In the general population of Alcalá, consumption of psychoactive drugs before March 11 (odds ratio, 4.9), history of psychiatric disorder (odds ratio, 3.8), history of more than one stressors in the 12 months before March 11 (odds ratio, 2.1), and having family members or close friend among victims of the terrorist attacks (odds ratio, 2.4).

Significant predictors of anxiety disorders other than PTSD were as follows:

Among the injured female gender (odds ratio, 5.6), low social support (odds ratio, 5.3), and having family members or close friend among victims of the terrorist attacks (odds ratio, 5.2).

In the general population of Alcala: a history of any life stressor during the last 12 months (odds ratio, 2.1), family members or close friends among victims (odds ratio, 2.7) and the use of psychoactive drugs before March 11 (odds ratio, 7.9).

4. Discussion

The results of our study are consistent with the evidence that in the aftermath of terrorist attacks there is a substantial burden of several mental disorders [10] and that persons directly affected by disasters have higher rates of post-event psychiatric disorders than persons indirectly affected by disasters [27,26,28,14].

A number of studies carried out in the New York City and the U.S. populations after the September 11 terrorist attacks

Table 3
Frequency of symptoms of PTSD in the three samples

	Injured ($N = 127$) (%)	Alcalá ($N = 485$) (%)	Police ($N = 153$) (%)
Criteria B (intrusive ideas)	96.1	87.2	60.1
Criteria C (avoidance behavior)	57.5	23.7	4.6
Criteria D (hyperarousal)	78.0	51.2	18.3

PTSD: post-traumatic stress disorder.

Table 4
Frequency of current comorbid mental disorders in the injured and the general population

	Injured (%)	Alcala (%)
Two or more mental disorders	52.8	22
PTSD + MD	25.2	4.5
PTSD + agoraphobia	16.5	2.8
PTSD + GAD	8.6	3.2
PTSD + panic disorder	7.0	1.2
MD + GAD	11.0	3.5
MD + agoraphobia	12.5	2.4

PTSD: post-traumatic stress disorder; MD: major depression; GAD: generalized anxiety disorder.

Table 5
Independent factors associated with different mental disorders among injured and the general population in the multivariate analyses

	Injured			Alcala		
	PTSD	MD	AD	PTSD	MD	AD
Use of psychoactive drugs before M11	7.9	7.4			4.9	7.9
Psychiatric history				6.4	3.8	
Female gender			2.2	5.6	2.4	
Any life stressor 12 months before M11				2.3		2.1
Two or more life stressors 12 months before M11			3.3		2.1	
Use of trains on M11				5.6		
Low-social support			5.3			
Relatives or friends among 11M victims			5.2		2.4	2.7

PTSD: post-traumatic stress disorder; MD: major depression; AD: anxiety disorders other than.
Numbers are significant odds ratios obtained by logistic regression for each mental disorder.

showed a high prevalence of PTSD, between 7.5 and 11.2% [10,33], in the first two months after those attacks. In our study, the prevalence of PTSD two month after of attacks, were 44.1% among victims, 12.3% among residents and 1.3% among policemen. The ESEMED study found a prevalence of PTSD within the previous year for the Spanish adult general population of 0.9% [1]. This suggests that in the first two months after the March 11, 2004 terrorist attacks, the prevalence of current PTSD was approximately 40 and 12 times higher than might have been expected at baseline among victims and residents of Alcala, respectively. By contrast these data suggest that the prevalence of PTSD among police officers in this sample was probably not substantially higher than might be expected at baseline.

In an empirical review of the post-disaster studies, Norris et al. [26] identified that depression was, after PTSD, the second most commonly mental disorder reported. One month after the World Trade Center attacks, 9.7% of residents of Manhattan suffered from probable major depression [33]. In contrast, two months after the attacks on the World Trade Center, there was no evidence of elevated prevalence of depression in the general US population [33]. In our study 31% of injured and 8.5% of persons in the population of Alcalá reported symptoms compatible with major depression. We estimate that the prevalence of current depression after the March 11 terrorist attacks increased nearly 10 times among victims and approximately two times among the population of Alcalá, respective to baseline rates [1].

Anxiety disorders, other than PTSD, are assessed in fewer than 20% of post-disaster studies. This few studies identify suggest that symptoms of quite often are substantially elevated over norms after disasters [26]. In our study, agoraphobia was, after PTSD and depression, the most frequent mental disorder assessed among injured (23.8%), and the most frequent mental disorder, after PTSD, in the population of Alcalá (10.5%). These findings suggest that in the aftermath of March 11, agoraphobia increased dramatically among the injured and in contrast with other studies [26,6] agoraphobia was the second most frequent mental disorder among residents of Alcalá. The high prevalence of agoraphobia is consistent with evidence from a recent published study of mental disorders among children after the September 11, 2001 terrorist attacks that showed that agoraphobia in that group was among the most common mental disorders recorded [15].

Our study showed a higher prevalence of mental disorders assessed, both for victims and residents compared to previous work. There are two likely reasons why we documented a higher prevalence of PTSD and depression among those injured and residents of Alcalá. First, our first sample was a sample of persons who were directly injured in the March 11, 2004 attacks, this contrast with other post-terrorism samples, which sampled persons were exposed but not necessarily injured in the attacks [12]. Second, our population sample was restricted to residents of Alcalá de Henares, a suburb where a substantial proportion of victims lived, and where nearly all members of this community known somebody injured or who died during the attacks.

We documented an unexpectedly low prevalence of depressive and anxiety disorders including PTSD among police officers. Previous work has found the prevalence of current PTSD in police officers and rescue workers after disasters to be between 5 and 20% [28,7]. For example, 13% of World Trade Center Rescue and recovery workers and volunteers after September 11 attacks in New York City met criteria for PTSD [7]. There are two possible explanations for these results. First, it is possible that police officers were underreporting psychological symptoms. The fact that the participation was completely anonymous and that we did not encounter any similar apparent underreporting in the other samples, using the same instrument, argues against this explanation. Second, and more likely, is that the police we interviewed were an elite corps of police officers, with extensive experience and training in handling of terrorist attacks. Seventy percent of police participants had previous participation in terrorist operations. It has been previously suggested, and our findings would also suggest, that highly trained rescue workers may have lower prevalence of psychopathology after disasters than do other rescue workers [29]. It is also possible that lower rates of prior psychiatric problems and reported greater social support in this group influenced their low rate of psychopathology. Further research to better understand the low prevalence of psychopathology among uniformed personnel after disasters is clearly warranted.

In our study a substantial proportion of persons with psychological disorders reported symptoms for two or more mental disorders, that is consistent with other observations of high rates of comorbidity among trauma victims [10,11,34].

Most epidemiological studies show that women are twice as likely as men to have any current mental disorder in the general population and in the post-disaster context [19,26,37]. In our study, women in general population sample were more likely to report PTSD consistent with the results of other studies [20,36,5]. However, this association was not

observed in victims. These data suggest that gender differences in the likelihood of PTSD may be superseded by other determinants of psychopathology in the group most heavily affected by a disaster. By contrast, we found a statistically significant association between gender and probable major depression and anxiety disorders, other than PTSD, among the injured, but not in the general population. This finding is consistent with observations made after the September 11 terrorist attacks [10].

Our study provides strong evidence of an association between history of psychiatric disorder (major depression and anxiety disorders), and previous psychoactive medication use and subsequent psychopathology. Although the prognostic role of previous psychiatric conditions in determining the risk of PTSD cannot be determined from a cross-sectional survey, this finding is consistent with previous research that suggests that persons with previous psychiatric histories are at substantially greater risk of further psychopathology after traumatic event experiences [21,4].

We found that the presence of previous life stressors, the use of psychoactive drugs, and having family members among the victims of the terrorist attacks were strongly associated with the presence of depressive and anxiety disorders in both samples. Also, a low social support level among the victims was strongly associated with the presence of anxiety disorders. These findings are in general consistent with other several studies that indicate an increased risk of major depressive disorders in those subjects with previous life stressors and with low social support [18,30,13] for current major depression.

5. Limitations

From an epidemiological point of view, there are at least two primary considerations in interpreting these results. First, inference from a cross-sectional study such as ours is limited and concerns about selection bias suggest caution in interpreting these results. However, the sampling strategy used for the three samples, the good participation achieved in the three groups, particularly in victims and general population, and the similar demographic characteristics of refusals and participants protect reasonably against these types of biases. From the clinical point of view, although, we used a validated and standardized symptom scale to assess PTSD and major mental disorders in the three groups, the results shown here do not substitute for clinician-diagnosed psychopathology. We note that we use the ESEMED study as comparison for the purposes of baseline estimation. There have been criticisms of this study and it is then possible that baseline prevalence of psychological disorders than the ESEMED study reports; in that case it is possible that the relative increase in psychological disorders after the March 11, 2004 terrorist attacks is lower than what is reported here. Finally we caution that cross-study comparison such as the comparisons drawn here are limited by the use of different measures of psychopathology in different post-disaster situations. Therefore, the comparisons of prevalences should be considered with caveats

in mind about cross-study comparisons when different measures of psychopathology are employed.

In conclusion the study showed marked differences in the burden of any mental disorders between groups with different exposure to the same traumatic event. Prevalence of PTSD, depression, anxiety disorders, and they co-morbidities were very high among injured, higher than expected among the general population but lower than expected among police officers. The low prevalence reported by policemen, suggest that highly trained rescue workers may be, to some extent, resilient to the consequences of exposure to mass traumatic events. These findings show the great magnitude of mental disorders after terrorist attacks and the opportunity to identify them with simple screening instruments. Public health practice would benefit from research that expressly considers how acute short-term population-based interventions may mitigate the psychological consequences of disasters.

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